

ORIGINAL ARTICLE

Factors Associated to the Knowledge of Cardiac Arrest by Health Professionals

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Abstract

Background: Knowledge of cardiac arrest by health professionals is associated with sociodemographic, occupational and training characteristics.

Objectives: To evaluate the factors associated with the knowledge of health professionals on Cardiac Arrest.

Methods: A cross-sectional study conducted in a large public hospital in the countryside of Bahia - Brazil. The sample consisted of 18 doctors, 32 nurses and 50 nursing technicians. To evaluate the knowledge of the professionals, a questionnaire was constructed according to the current guidelines for resuscitation of the American Heart Association of 2015, and after that, it was submitted to three judges with expertise in PCR to verify content validity. Data were analyzed through descriptive statistics with univariate, bivariate and multivariate analyses using the logistic regression model. A value of $p < 0.05$ was adopted as level of significance.

Results: The prevalence of insufficient knowledge of cardiac arrest among health professionals was 78%. After logistic regression, belonging to the professional category of nursing technician ($p = 0.003$) and nurse ($p = 0.001$) and working in the form of on-call duty for 24h ($p = 0.005$) was associated to insufficient knowledge.

Conclusions: Insufficient knowledge of cardiac arrest among health professionals is high, which is a problem that requires urgent interventions in order to guarantee the quality of care. These actions should be based on realistic scenarios involving theoretical and practical activities. The periodicity of training should be short, given the deterioration of knowledge. The creation and validation of the data collection instrument allows for its applicability in other studies. (Int J Cardiovasc Sci. 2020; 33(2):167-174)

Keywords: Heart Failure; Heart Arrest; Cardiopulmonary Resuscitation; Health Personnel; Mortality & Morbidity; Nurses.

Introduction

Cardiac arrest (CA) is a serious life-threatening emergency situation. Among all life-threatening emergencies, this is considered the most fearsome, since the chance of the victim surviving is directly related to fast, safe and effective care.¹

According to the Brazilian Society of Cardiology, 200,000 cardiac arrests occur annually in Brazil, and approximately half of these occur in a hospital environment.²

CA is a situation that requires immediate and rapid action by health professionals, since it involves risk to the patient, given that the chance of survival after the

event ranges from 2% to 49%, depending on the initial heart rate and early initiation of resuscitation.³ However, survival may double or triple when cardiopulmonary resuscitation (CPR) is performed with high quality.⁴

The high morbidity and mortality rate caused by CPR, as well as the risk of imminent death and the high chances of disability that this event can cause, support the conduction of a survey of the knowledge among health professionals on this topic, since this knowledge can be related to several characteristics, such as sociodemographic, occupational and professional training, even with the presence of guidelines and protocols for CPR.

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The aim of this study is to evaluate the factors associated with the knowledge of Cardiac Arrest by health professionals in a general hospital in the countryside of Bahia - Brazil, as well as to estimate the prevalence of health professionals' knowledge of CPR.

Methods

This is a cross-sectional study performed in a large public hospital with a partnership with the Unified Health System, located in the municipality of Feira de Santana, in the countryside of Bahia.

The sample of this study consisted of 100 participants, of which 18 were doctors, 32 nurses and 50 nursing technicians who worked in the Medical Clinic, Surgical Clinic, Orthopedic Clinic, Semi-Intensive Care, Adult Intensive Care Units, and Units constituting the Emergency section.

Sampling was conducted by accessibility considering the following inclusion criteria: having worked as a physician, nurse or nursing technician of the aforementioned units; having been involved in the procedures related to cardiac arrest in the last 12 months. Exclusion criteria were: doctors, nurses or nursing technicians who were on medical leave, vacation or certified by the time of data collection.

The data collection instrument was divided into four blocks: sociodemographic, occupational, training characteristics and the specific block to evaluate knowledge of CA/CPR, named *Questionário de Conhecimento sobre Parada Cardiorrespiratória e Ressuscitação Cardiopulmonar* (Knowledge of Cardiac Arrest and Cardiopulmonary Resuscitation Questionnaire – KCACPRQ). It was created according to a literature review and the American Heart Association guidelines of 2015.⁵ In order to evaluate the content validity of the first version, the KCACPRQ was subjected to evaluation by three judges, a nurse, a doctor and a nursing technician, with expertise in Cardiac Arrest and Cardiopulmonary Resuscitation as instructors of Advanced Cardiovascular Life Support (ACLS). These experts assessed the criteria clarity, relevance, content and feedback for each of the CA/CPR questions, and also provided comments and suggestions that qualified the instrument. The judges were allowed, at the time of assessment, to consult the new AHA –2015 guidelines in order to clarify any doubts.

After the assessment, approval and meeting the modifications suggested by the group of judges, the final version of the questionnaire with 20 items was elaborated,

with five response options, with only one of these being considered correct.

Before the actual collection, a pre-test was carried out with a professional from each category in order to detect a potential need for modifications of the questionnaire, and data collection then began. Data collection took place between January and February 2018, after approval by the Research Ethics Committee.

In order to verify the ease with which participants responded to the KCACPRQ, the feasibility of the questionnaire was assessed.⁶ For this purpose, at the end of each application respondents positioned themselves in an instrument that used as parameters: the level of easiness to understand the instructions of the questionnaire, to understand the questions/items and to indicate the answers.

Participants were approached in the workplace and when they accepted to participate, they answered individually to the questionnaire, without the aid of electronic devices or consultation material.

To estimate the professionals' knowledge of CA and CPR, the KCACPRQ generated a percentage from 0 to 100%, since each correctly answered question corresponds to a 5% success rate. The AHA conducts ACLS courses in which the student, in addition to performing well in the practical test, must obtain a minimum score in the written test. In order for the student to obtain a certificate at the end of the test, the AHA establishes a minimum criterion of correctness of 84% in theoretical test.⁵ In this study, 85% was adopted as the cut-off point, so the participant who scored 85% or better was classified as having sufficient knowledge. For those who scored below 85%, these were classified as having insufficient knowledge.

The research protocol was evaluated and approved by the Research Ethics Committee of the *Universidade Estadual de Feira de Santana* (CAAE: 78645817.2.0000.0053). The participants of the study had autonomy to agree to participate or not, after signing the Term of Free and Informed Consent, which clarified their rights. In addition, the ethical standards of the Declaration of Helsinki of 1975, revised in 2008, were followed, as well as those of Resolution 466/2012.

Statistical analysis

The data were analyzed through univariate, bivariate and multivariate analyses. In the univariate analysis, the absolute and relative frequencies of each categorical variable were estimated. For the quantitative variables,

the descriptive measures of centrality and dispersion were calculated.

In bivariate analysis, the prevalence ratios with their respective confidence intervals, at the 95% level, were estimated for the crossing between level of knowledge and the other variables related to sociodemographic characteristics, occupational characteristics and health professional's training characteristics on CA. To perform these two analyses, the application software Statistical Package for the Social Sciences version 22.0 was used.

Pearson's Chi-square test (X^2) or Fisher's exact test was used in the selection of variables for this multivariate analysis. The level of significance for entry in the multivariate model was $p \leq 0.10$.

To verify the factors associated with health professionals' knowledge, the multivariate logistic regression model was used, one of the most important tools in the statistical analysis of data when one intends to predict the occurrence of a given event as a function of a set of variables. Applying the logistic regression model is a form of statistical modeling suitable for categorical and usually dichotomous response variables.⁷

The dependent or response variable was the knowledge of professionals and the independent variables were sociodemographic, occupational and training variables that were included in the model. For purposes of analysis, the continuous variables that entered the model were recategorized based on the theoretical framework.

After defining the final multivariate model, the results obtained in Odds Ratio were converted to Prevalence Ratio using Poisson's Regression. After adjustment of the model with the "maximum likelihood" estimator, the significance of the model variables was evaluated through Wald's Test. In order to evaluate the accuracy and goodness-of-fit of the logistic model, the Hosmer-Lemeshow⁷ test was used. The level of statistical significance adopted was 5%. For this analysis, the application software Data Analysis and Statistical Software version 12.0 was used.

Results

Construction and evaluation of content validity of the KCACPRQ

The questionnaire submitted for evaluation of the judges presented 22 questions on Cardiac Arrest and Cardiopulmonary Resuscitation. The judges pointed out that eight of these questions lacked clarity, which

required changes to achieve comprehensibility. The content was considered adequate in 21 questions, and only one item was considered inadequate. The pertinence of the items in their respective categories was considered adequate by the judges. The analysis of the feedback of the questions resulted in seven items with divergent templates, and changes were made to meet this criterion.

The judges pointed out two items with confusing formulations and with content contemplated in other items, and as such, they were withdrawn from the instrument in order not to harm the knowledge determination of the participating professionals. Ten items had changed the wording of the statement and the organization of the alternatives. Thus, the final version of the questionnaire has 20 questions about cardiac arrest and cardiopulmonary resuscitation (Chart 1).

The pre-test showed that the professionals answered the instrument without difficulties and considered the instrument adequate. Regarding the practicality of the instrument, Table 1 presents its main results.

Profile of health professionals

The study included 100 health professionals, of whom 50% were nursing technicians, 32% as nurses and 18% as doctors. Among the professionals, it was observed that 78% were women. Approximately half, 50.5%, were over 35 years of age. The most prevalent self-reported skin color was black or brown (72%). With regard to schooling, 34% had a graduate degree. The most mentioned marital status was not having a partner (52%). More than half (57%) reported having children.

Regarding occupational characteristics, the majority (83%) of professionals worked in closed units. The most prevalent work time was over 05 years (76.8%). A large proportion (61.6%) of the professionals worked full time. About 56.6% of the participants reported a different employment relationship. The most prevalent work shift was the on-call duty (68%). With regard to the working day, 37.9% worked with a weekly workload between 30 and 40 hours.

Regarding training characteristics, the majority (59%) of professionals had up to 10 years of training. Regarding training in CA/CPR, 80.8% of the professionals reported having received it. Training in CA/CPR at work was reported by 57.6% of participants. The time interval that received training in the most frequent CA/PCR was 06 months ago (44.9%). Regarding the time of contact with CA/CPR, the majority (69.2%) reported it as being

Chart 1 - Items of the *Questionário de conhecimento sobre parada cardiorrespiratória e ressuscitação cardiopulmonar* categorized by area of knowledge

Category	Question
CA diagnosis 02 items	1. Which pulse should be checked for the initial evaluation of the patient? 2. How much time should be used to check pulse and breath at the same time?
Ventilation 04 items	4. What is the compression-ventilation relationship with the patient that has CA but has not yet been intubated? 5. What is the compression-ventilation relationship with the CA patient who was intubated? 12. How should the patient be ventilated in CA if it is connected to the mechanical ventilator? 13. What is the oxygen flow for patient ventilation when in CA?
External thoracic compression 05 items	6. With which frequency are External Thoracic Compressions done after intubation? 7. What should be the depth of the External Cardiac Compressions? 16. It is a characteristic of the quality of External Thoracic Compression: 17. Regarding the return of the chest after the External Thoracic Compression: 18. How and what should be the support site for the health professional's hands on the patient's chest in order to perform External Thoracic Compressions?
Defibrillation 05 items	3. What is the recommended course of initial care in the case of CA for Non-Pulse Ventricular Tachycardia? 8. What are CA rhythms that should be treated with defibrillation? 9. What are CA rhythms that should NOT be treated with defibrillation? 10. What is the maximum energy load used in the Single Phase and Biphasic Defibrillator for "shockable" CA rates, respectively? 15. After defibrillation, what should be the next step?
Medications 04 items	11. What is the dose and frequency of Adrenalin administration in CA? 14. How should medications be prepared and administered during CA? 19. Which drug is used at all CA rates? 20. When indicated, which doses of Amiodarone for the first and second administrations, respectively?

between 0 and 30 days. The most reported mean CA/PCR service was between 0 and 2 CA/PCR per month (44.7%). Regarding the perception of personal security when assisting, 79.8% reported feeling safe to perform care in CA/CPR.

Prevalence of knowledge of Cardiac Arrest and Cardiopulmonary Resuscitation among health professionals

Table 2 presents the prevalence of this study's outcome, considering an 85% criterion, according to the American Heart Association.

A total of 78% of health professionals presented insufficient knowledge about Cardiac Arrest and Cardiopulmonary Resuscitation. Only 22% of the participants presented sufficient knowledge.

Factors associated with the knowledge of cardiac arrest and cardiopulmonary resuscitation by health professionals

After analyzing the level of knowledge and other variables, the following ten variables were added to the final model for multivariate analysis⁷: female sex ($p = 0.015$), technical level of education ($p = 0.045$), professional category as nurse ($p = 0.000$) and nursing technician ($p = 0.000$), had another job ($p = 0.083$), worked under on-call duty ($p = 0.009$), weekly workload above 40 hours ($p = 0.003$), receiving CA/CPR training for over 12 months ($p = 0.048$), time of contact with CA/CPR over 30 days ($p = 0.046$) and not having personal safety in performing CA/CPR ($p = 0.037$). The results of the logistic regression are shown in Table 3.

Diagnostic analysis of the final model was performed using the Hosmer-Lemeshow test, which revealed

Table 1 - Practicability assessment - Knowledge questionnaire on cardiac arrest and cardiopulmonary resuscitation

Practicability assessment	n	%
I found it easy to understand the instructions of the questionnaire (n = 100)		
Strongly agree	50	50.0
Slightly agree	33	33.0
I have no opinion about it	4	4.0
Slightly disagree	11	11.0
Strongly disagree	2	2.0
I found it easy to understand the questions in the questionnaire (n = 99)		
Strongly agree	49	49.5
Slightly agree	34	34.3
I have no opinion about it	3	3.0
Slightly disagree	11	11.1
Strongly disagree	2	2.0
I found it easy to mark the answers of the questionnaire (n = 99)		
Strongly agree	55	55.6
Slightly agree	29	29.3
I have no opinion about it	0	0.0
Slightly disagree	12	12.1
Strongly disagree	3	3.0

p = 0.73, demonstrating the goodness-of-fit of the final model.

Discussion

Developing and validating a data collection instrument based on the methodological aspects that guide this elaboration⁸ constituted a primordial phase to ensure the correct measurement of the outcome variable. The development of the questionnaire focused on central issues related to the topic and, above all, it was focused on the main changes of the 2015 AHA guidelines. By validating the content of the instrument with judges and the participants themselves, while taking into account the indicators of clarity and pertinence, it was possible to achieve the necessary adequacy of the

Table 2 - Prevalence of knowledge of Cardiac Arrest and Cardiopulmonary Resuscitation among health professionals

Knowledge of Cardiopulmonary Arrest and Cardiopulmonary Resuscitation by Health Professionals (n = 100)	n	%
Sufficient	22	22
Insufficient	78	78

Table 3 - Multivariate analysis of logistic regression type for Insufficient Knowledge of Cardiac Arrest⁷

Variable	Prevalence ratio	CI (95%)	p-value
Professional category (n = 100)			
Doctor	*		
Nurse	3.21	1.591 – 6.847	0.001
Nursing technician	2.98	1.470 – 6.426	0.003
Work shift (n = 100)			
Day and night service	*		
On-call duty	3.05	0.630 – 0.904	0.005

instrument in capturing what it proposes to measure,⁸ in this case the knowledge of professionals on a specific topic. In addition, considering the dimensionality of the instrument, it can help professionals to identify the knowledge gaps, providing support for actions directed to fragility points that can be developed.

The evaluation of knowledge about CA/CPR among medical, nursing, and life sciences undergraduate students, among others, has been the subject of scientific publications and, at the same time, reveals the insufficiency of knowledge in this area, corroborating with the results found in this study.⁹⁻¹³

This is an important finding, since knowledge is considered the triggering factor for decision-making and behavior, essential to guarantee the subsidies of the conducted procedures in order to maintain the victim's life.¹⁴⁻¹⁵ Thus, the knowledge the professional possesses is a determinant factor in the survival of patients who are afflicted by CA.^{10,16}

The high prevalence of insufficient knowledge about cardiac arrest can be explained by several factors. The actions of permanent education in health in these services, and even the search for qualification courses can be considered as part of the process of training these professionals in their respective studies. A study among undergraduates in health sciences showed that 99.9% of the participants did not reach the 84% minimum score recommended by the American Heart Association, characterizing insufficient knowledge about the subject of Basic Life Support.¹³

During the training of nurses, the theoretical and practical contents on CA/CPR have been worked in a very limited and superficial way, and in most cases do not meet the needs of students.¹⁶ Nursing professionals are often subjected to grueling workloads, as well as low salaries and double work hours. These facts contribute to the reduction of time dedicated to improvement and search for knowledge. Organizational aspects of the work may influence the participation of nurses in training, drawing attention to the absence of time allocated for this purpose, little financial resources, and shiftwork.¹⁷

One study showed that only 6% of nursing undergraduate students in a pre-test achieved at least the minimum score for resuscitation. However, after the training course, the percentage of approvals increased to 72%.¹⁸ Another study conducted among nursing undergraduate students in Brazil also presented similar results, in which approximately 20% of the students knew the correct conduct after the detection of CA.¹⁹ This fact brings important information: even during undergraduate studies, the students have low knowledge on this topic, evidencing the fragility of their education. However, it demonstrates the effectiveness of the training program.

In an international context, a recent study carried out in a tertiary hospital in Tanzania showed poor performance of health professionals in theoretical and practical tests (only 4% scored higher than 75% in the theoretical test).²⁰ The multiprofessional team is responsible for the first service in CA cases, hence why in many cases, training for the recognition and initial care of this situation is necessary. As a potential strategy, the deployment of Rapid Response Teams to act in emergencies and actions of permanent education can be effective.²¹

A study carried out in a hospital with 750 beds in India showed the impact of training in CPR with respect to the

return to spontaneous circulation and living hospital discharge among the studied patients. The study showed that return to spontaneous circulation increased from 19.7% to 30.1% after the team training, and hospital discharge alive rates rose from 27.5% up to 52.9%.²²

Poor knowledge of professionals requires constant updating of CA protocols. Although there is interest on the part of professionals to undertake improvement courses in this area, some barriers are still found, such as the lack of initiative of managers or employers in order to guarantee resources, spaces and incentive.²³

This study presents some limitations that should be considered. Among them, we highlight a convenience sample, not allowing the generalization of the results found. Selection bias may have occurred, since the participation of the professionals happened through their availability for acceptance, in addition to the TCLE signature having a certain identification, making professionals feel less comfortable to respond, leading to refusal to participate in this study. Moreover, it was not possible to evaluate the practical ability of professionals in this stage of the study.

Conclusions

The current prevalence of insufficient knowledge about cardiorespiratory arrest among the health professionals studied is high, a serious problem that requires urgent interventions in order to guarantee the quality of care during cardiopulmonary resuscitation. These actions should be based on realistic scenarios, involving theoretical and practical activities, using active teaching methodology in order to obtain a good result in the teaching-learning process. The periodicity of training should be short, given the deterioration of knowledge and new evidence that may arise with respect to actions related to cardiopulmonary resuscitation.

These results can subsidize permanent health education teams of hospitals and non-hospital institutions, as well as technical training schools and universities, especially in nursing degrees and technical nursing courses.

The creation and validation of the data collection instrument allows for its applicability in other studies, in addition to being able to be used in non-hospital units that attend severe patients with imminent cardiac arrest, and educational institutions could similarly evaluate the students' knowledge about the subject.

Author contributions

Conception and design of the research: Novaes Neto EM, Freitas KS. Acquisition of data: Novaes Neto EM. Analysis and interpretation of the data: Novaes Neto EM, Freitas KS. Statistical analysis: Novaes Neto EM, Freitas KS. Writing of the manuscript: Novaes Neto EM, Freitas KS. Critical revision of the manuscript for intellectual content: Novaes Neto EM, Freitas KS.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any thesis or dissertation work.

Ethics approval and consent to participate

This study was approved by the Ethics Committee of the *Universidade Estadual de Feira de Santana* under the protocol number 7864.5817.2.0000.0053. All the procedures in this study were in accordance with the 1975 Helsinki Declaration, updated in 2013. Informed consent was obtained from all participants included in the study.

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